

**REMARKS**

This Application has been carefully reviewed in light of the Office Action mailed November 27, 2006. Claims 1-39 are pending in the Application. The Office Action rejects Claims 1-39. Applicant respectfully requests reconsideration and favorable action in this case.

According to the Office Action, the Examiner has interpreted the term “multi-objective optimization” to mean “energy balancing of the roller-cone bit forces (paragraph, 0177) using optimization techniques known in the engineering art . . . including Weighted Sum Method, the Single Objective Method and the Goal Attainment Method . . .” (*See Office Action*, page 2). Applicant respectfully disagrees with this interpretation since it is inconsistent with the specification.

**Claim Rejections – 35 U.S.C. § 112**

The Examiner rejects Claims 1-8, 17-24, and 33-39 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Applicant respectfully traverses these rejections.

The Office Action contends that the limitation “simulating operation of a drill bit [having] multiple design parameters through a formation to be drilled” is not enabled by the specification. *See Office Action*, page 3. Applicant respectfully disagrees.

Applicant refers to FIGURES 23a-23c, and in particular FIGURE 23c, which delineate steps for simulating the operation of a drill bit. Reference number 138 identifies a step in which cutting depth, area, volume and forces are calculated for teeth in cutting. The hole bottom matrices are updated based on the crater model for rock being drilled. A person of ordinary skill in the art would appreciate that rock being drilled refers to the formation being drilled. The step further involves projecting the teeth force into cone and bit coordinates and getting the total cone and bit forces and moments. Additional information regarding simulating operation of a bit by a three-dimensional model of the interaction of the bit is described at paragraph 0187 of the present application (US 2004/0230413 A1).

It is well settled that “the test of enablement is whether one reasonably skilled in the art could make and use the invention from the disclosures in the patent coupled with

information known in the art, without undue experimentation”. *See MPEP 2164.01* (quoting *United States v. Telectronics, Inc.*, 857 F.2d 778 (Fed. Cir. 1988). Moreover, “a patent need not teach, and preferably omits, what is well known in the art”. *See MPEP 2164.01* (quoting *In re Buchner*, 929 F.2d 660 (Fed. Cir. 1991). Applicant respectfully contends that the limitation “simulating operation of a drill bit having multiple design parameters through a formation to be drilled” is described in the specification in such a way that one of ordinary skill in the art could make and use the invention from the disclosures in the patent coupled with information known in the art, without undue experimentation. For at least these reasons, Applicant respectfully requests that the rejection of Claims 1-8, 17-24, and 33-39 be withdrawn.

The Examiner rejects Claims 9-16, and 25-32 under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. Applicant respectfully traverses these rejections.

Specifically, the Office Action contends that Claims 9 and 25 are “incomplete” since “there appears to be no result or application relating to the bit design from the combination of the objectives”. *See Office Action*, page 4. Applicant respectfully disagrees. One step in a method for designing roller-cone bits may be “adjusting multiple bit design parameters by reference to a multi-objective optimization”. Simply because the multi-objective optimization may include or imply additional steps does not make such steps “essential steps” to the claimed invention.

The Office Action also contends that Claims 9 and 25 are “not consistent” with the design process as disclosed in FIGURE 1. Whether or not this is true, it is not dispositive of the issues regarding essential steps. Simply because certain steps are disclosed as part of certain embodiments, does not make such steps “essential” to the claimed invention.

For at least these reasons, Applicant respectfully requests that the rejection of Claims 9-16 and 25-32 be withdrawn.

The Examiner rejects Claims 8, 16, 24, 32 and 39 under 35 U.S.C. § 112, second paragraph, as failing to provide antecedent basis for the claimed subject matter. Applicant respectfully traverses these rejections.

Each of Claims 8, 16, 24, 32 and 39 refer to “[a] method of drilling” and not “the method of drilling”. As such, these claims do not require antecedent basis for the phrase “a method of drilling”. For at least these reasons, Applicant respectfully requests the withdrawal of the rejection of Claims 8, 16, 24, 32 and 39 under 35 U.S.C. § 112 second paragraph as failing to provide antecedent basis.

#### **Claim Rejections – 35 U.S.C. § 101**

The Examiner rejects Claims 9-16, and 25-32 under U.S.C. § 101 because the claimed invention is drawn to non-statutory subject matter. Applicant respectfully traverses these rejections. However, in order to advance prosecution, Applicant amends Claims 9 and 25. Applicant respectfully contends that amended Claims 9-16 and 25-32 are drawn to statutory subject matter.

#### **Claim Rejections – 35 U.S.C. § 103**

The Examiner rejects Claims 1-39 under 35 U.S.C. § 103(a) as being unpatentable over “The Operational Mechanics of The Rock Bit”, Ma et al., Petroleum Industry Press, Copyright 1996 (of record) (“Ma”) in view of applicants own admission (“AOA”). Applicant respectfully traverses these rejections.

The Office Action contends that Applicant admits that “the present invention incorporates multi-objective optimization techniques known in the engineering art”. Applicant respectfully disagrees, since this is a mischaracterization of Applicant’s specification. *See Office Action*, page 7. Moreover, simply admitting that “techniques for solving a multi-objective optimization problem are wide and varied” does not imply or suggest that any specific technique is “prior art” to Applicant’s invention or that the invention “incorporates” any specific techniques.

Claims 1 and 9 are directed to methods of designing roller-cone bits that include adjusting multiple bit design parameters by reference to a multi-objective optimization which combines objectives related to maximizing rock removal of subelements,

objectives related to equalization of rock removal among groups of said subelements, and also objectives related to minimization of one or more shock loading components. Neither Ma nor any “admission” by Applicant disclose, teach or suggest each of these limitation.

Claims 17 and 25 are directed to methods for designing roller-cone drill bits that include adjusting multiple bit design parameters by reference to a multi-objective optimization which combines objectives related to maximizing rock removal of subelements, objectives related to equalization of rock removal among groups of said subelements and anti-tracking objectives. Neither Ma nor any “admission” by Applicant disclose, teach or suggest these limitation.

Claim 33 is directed to an algorithm for optimizing a roller-cone bit that includes calling a simplified two-dimensional bit/formation interaction model and scaling said two-dimensional results using initial three-dimensional results. Neither Ma nor any “admission” of Applicant discloses, teaches or suggests each of these limitation.

For at least these reasons, Applicant respectfully contends that Claims 1, 9, 17, 25 and 33 are each patentably distinguishable from the references cited by the Office Action. Moreover, each of their dependent claims 2-8, 10-16, 18-24, 26-32 and 34-39 are patentably distinguishable from such references for similar reasons.

**CONCLUSION**

Applicant has now made an earnest attempt to place this case in condition for immediate allowance. For the foregoing reasons and for other apparent reasons, Applicant respectfully requests full allowance of all pending claims.

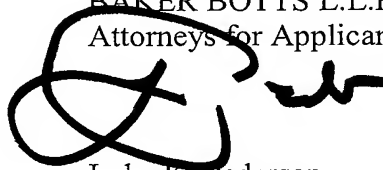
If the Examiner feels that a telephone conference or an interview would advance prosecution of this Application in any manner, please feel free to contact the undersigned attorney for Applicant.

Applicant hereby takes an extension of time to accompany this RCE for three months from **February 27, 2007 to May 27, 2007.**

The Commissioner is hereby authorized to charge the \$790.00 RCE fee, the \$1020.00 Extension of Time fee, and to the extent necessary, charge any additional required fees or credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.  
Attorneys for Applicant

A handwritten signature in black ink, appearing to be 'Luke K. Pedersen', is written over the printed name.

Luke K. Pedersen  
Reg. No. 45,003

Date: May 24, 2007

**CORRESPONDENCE ADDRESS:**

Customer Number:

**05073**